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PREFACE

This issue of *AIR Professional File* features a set of articles offering insights and practical recommendations for tackling questions central to the IR/IE community. Specifically, how do we define and measure key constructs such as minority-serving institutions (MSIs), students with disabilities, or student-institution fit, and when is a measure appropriate to use? Notably, the authors spotlight several different institution types—MSIs, community colleges, and a large public research university.

Jacqueline Mac and her co-authors review criteria for defining MSIs and propose a holistic approach to understanding the extent to which MSIs serve their target population. They stress the need for comprehensive metrics that go beyond enrollment numbers, such as equitable student outcomes and markers of a serving culture. The authors draw attention to the important role of MSIs in advancing educational equity and call for improved data collection practices—such as additional variables in IPEDS—to facilitate research about MSIs and their impact on student success.

John Zilvinskis writes about student use of disability services, a topic covered in a recent Data report by the *Chronicle of Higher Education*. Importantly, Zilvinskis examines *differences* in how the use of disability services is measured. Comparing Community College Survey of Student Engagement (CCSSE) and Integrated Postsecondary Education Data System (IPEDS) data, he finds moderate correlations between reported service use and the number of students formally registered with the institution's Office of Disability Services, suggesting an incongruity between measures. Similar to Jacqueline Mac and her co-authors, Zilvinskis advocates for a comprehensive approach to measuring the use of disability services, one that is not limited to only those students who formally register on campus.

Steven Graunke examines the applicability of a student-institution fit survey instrument across educational settings. Using confirmatory factor analysis, he analyzes the results of the survey administered at a large public university and describes modifications to the underlying factor structure needed for adapting the instrument to the new institutional context. His study highlights that, in addition to administering surveys, institutional research offices must test and potentially modify

existing instruments for use in their unique settings.

Together, these articles underscore the important role that IR/IE professionals can play in ensuring data integrity and adopting a holistic, contextually relevant approach to institutional research, ultimately contributing to the advancement of educational equity and student success in higher education.

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Convergence Issues for Disability Measures at Public 2-Year Institutions

John Zilvinskis

About the Author

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Abstract

The purpose of this study is to demonstrate how triangulating responses from the Community College Survey of Student Engagement (CCSSE) with information from the federal Integrated Postsecondary Education Data System (IPEDS) exposes data incongruency, specifically when considering the population of students with disabilities at 2-year institutions. Data from 503 CCSSE institutions were aggregated to calculate the average proportion of respondents who use services for students with disabilities, and then were compared to the percent of undergraduates who are formally registered with the institution's Office of Disability Services, as reported to IPEDS. Pearson correlation coefficients indicated statistically significant relationships, that are yet moderate in strength, between these measures of disability services use ($.274 < r < .331$), compared to strong correlations of measures of gender, race, and enrollment ($.618 < r < .955$). These effects indicate an incongruency between measures of disability, compared with other aspects of demography. Accounting for coverage of survey data using a multiple linear regression model did not improve convergence. These findings have implications both for institutional staff to triangulate their data to see if there is a need to review reporting procedures, and for higher education scholars who work with these data to understand the proportion of disabled students in the 2-year sector.

Keywords: students with disabilities, Community College Survey of Student Engagement (CCSSE), Integrated Postsecondary Education Data System (IPEDS)

INTRODUCTION

 Students with disabilities are prevalent in community colleges and deserve accurate reporting. According to the National Center for Educational Statistics (NCES), 19.4% of undergraduate students identify as having at least one disability; many of these students are concentrated at 2-year colleges (De Brey et al., 2021). In 2018 total undergraduate Fall enrollment at public 2-year institutions was 5,546,704, which represents 28% of all students enrolled in degree-granting postsecondary institutions. Using data from the National Longitudinal Transition Study-2 (NLTS2), Sanford et al. (2011) found that high school students with disabilities were most likely to enroll in "2-year or community colleges (44 percent) than in vocational, business, or technical schools (32 percent) or 4-year colleges or universities (19 percent)" (p. xv). Both this student population and this institution type represent substantial portions of the higher education landscape, yet remain understudied in scholarship (Madaus et al., 2021). Even measuring basic information, such as the size of the disabled student population on a college campus, can be difficult (Center for Student Success Research, 2020); in addition, measurements can vary greatly based on how instruments are designed to count this group (Van Noy et al., 2013). Because of the size of this population, correct measurement of students with disabilities in the 2-year sector is a relevant issue for both institutional researchers and academic scholars studying pathways to success for these students.

Measuring student disability in surveys can vary greatly between instruments. For example, the National Survey of Student Engagement asks respondents, "Do you have a disability or condition that impacts your learning, working, or living activities?" in line with the Americans with Disabilities Act (ADA) definition of disability (Zilvinskis et al., 2021).[1] Meanwhile, the National Postsecondary Student Aid Study (NPSAS, 2016) measures respondents' degree of disability or condition related to functions like walking, hearing, and concentrating. The current study aims to contribute to understandings of these students at these institutions by validating two common measures of disability, or rather student use of disability services, through data collected on the Community College Survey of Student Engagement (CCSSE) as well as information reported to the Integrated Postsecondary Education Data System (IPEDS). Accurate CCSSE reporting requires representative survey sampling among students who use disability services. On the other hand, accurate IPEDS reporting requires coordination between institutional reporters and disability service staff to count the number of students who have formally registered for accommodation.

Reporting an accurate proportion of disability students is important, because population size estimates may lead to reduced resource availability for institutions and a reduction in services for misidentified students. For example, institutions writing a Student Support Services Proposal for additional federal funding from the U.S. Department of Education need to begin their proposal with a section titled "Need for the Project." This section includes not only counts of students with disabilities, but also specific measures for improvement. Without accurate counts of these students, and therefore measurable benchmarks, these proposals, needs, and additional resource requests go underrealized.

Disability research has presented concerns regarding the validity of federal data collected

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1   The ADA defines a person with a disability as a person who has a physical or mental impairment that substantially limits one or more major life activity

through the NPSAS by comparing these data to information collected in the NLTS2 (Leake, 2015). The current study contributes to this line of inquiry by using two cross-sectional large data sets to investigate the validity of disability measures. The current study realizes the recommendation posed by the Center for Student Success Research (2020) of "using multiple ways of understanding and representing disability is recommended, in order to provide more nuance and ultimately to better support students" (p. 1). In a recent systematic review of higher education literature from 1951 to 2017, Madaus et al. (2021) found only 113 articles on the topic of students with disabilities at community college. Of those few studies, only 11 used correlational research methods. This current study is important because it contributes to an under-researched, yet widely represented, sector of the academy.

The research questions that guided this study were as follows:

1 | Is the aggregated institutional average use of disability services (measured on the CCSSE) statistically, significantly correlated with the federal percentage of formally registered students with disabilities (collected through IPEDS)? If so, what is the strength of these correlations compared with other aspects of demography such as gender, race, and enrollment?

2 | When accounting for coverage of the CCSSE survey responses, does the strength of this relationship improve?

METHODS

Data used in the current study were drawn from institutions that participated in the 2017, 2018, or 2019 administration of the CCSSE. The original sample included 103,058 student survey responses from 584 2-year institutions. These data were merged with 2018 institution-level information from the IPEDS. Data were used with permission from the Center for Community College Student Engagement, *The Community College Survey of Student Engagement 2017–2019*, The University of Texas at Austin, funded through a research grant by the ACPA–College Student Educators International Foundation. Listwise deletion was used to remove individual respondents with missing data on the CCSSE measure of disability. Afterward, only institutions with at least 100 responses were retained for analysis to procure a representative subsample for the institutions, resulting in a sample of 96,985 respondents from 503 public community colleges. Student demography of the survey sample indicated 54% identified as women, 10% identified as Black or African American, and 30% were enrolled part time. IPEDS data indicated the average institution representation of women was 58%, of Black or African American students was 12%, and of part-time students was 62%.

INSTRUMENTS

The CCSSE has been demonstrated as a reliable measure of community college student engagement (McClenney & Marti, 2006; McCormick & McClenney, 2012). Furthermore, the instrument is representative of community college students as McClenney (2019) detailed: "Through 2017 the Center for Community College Student Engagement had surveyed more than 2.9 million students (representing a population

of 6.4 million) at 951 colleges in fifty states" (p. 88). However, as Kimball et al. (2016) distinguished in their assessment of research on students with disabilities, surveys on student engagement "are not nationally generalizable but . . . contain large samples of college students" (p. 126). The CCSSE (2024) was administered as a paper survey to randomly selected classes (credit courses only) at each participating college.

IPEDS (2018), "is an annual data collection distributed by the Postsecondary Branch of the National Center for Education Statistics (NCES), a non-partisan center within the Institute of Education Sciences under the U.S. Department of Education" (para. 2). IPEDS data include "postsecondary institutions that grant an associate's or higher degree and whose students are eligible to participate in Title IV federal financial aid programs" (De Brey et al., 2021, p. 215).

MEASURES

Disability service use is measured in two different ways on the instruments tested. On the CCSSE, respondents are asked, "How often have you used the following services during the academic year?" Student-level responses for use of disability services were aggregated to an institution average reflecting measures that were first liberal (at least one time per academic year), then conservative (two or more times per academic year). For the IPEDS data, the disability measure used was, "Percent of undergraduates who are formally registered as students with disabilities when percentage is more than 3 percent." These data were also recoded, first only with institutions reporting percentages more than 3% (a conservative estimate), then replacing missing institutional measures with an

average value of 1.5% (a liberal estimate). "Use" and "registration" are not the same measures conceptually, an important discrepancy explored more below, and one that precludes this work from being a data quality paper, but instead leaves it as an investigation on data incongruency.

ANALYSIS

To answer the first research question, Pearson correlation coefficients were calculated to determine if there are statistically significant and practically significant relationships between CCSSE sample measures aggregated to the institution level and the reported IPEDS values from the institutions in the sample. When reviewing the scatterplots of the corresponding variables (e.g., the CCSSE aggregated value of part-time respondents with the IPEDS institution value of part-time students) the assumption of linearity was met considering the visual evidence of association (Lomax & Hahs-Vaughn, 2013). When interpreting the results, a conservative threshold for statistical significance was used ($p < .01$), while Cohen's (1988) interpretation of r as an effect size determined practical significance ($r = .1$ as trivial, $r = .3$ as moderate, and $r = .5$ as strong; also adopted in higher education research [Mayhew et al., 2016]).

To answer the second research question, a multiple linear regression model was built to measure the relationship between the liberal IPEDS measure of disability service use (dependent variable) with the conservative CCSSE sample measure and institutional coverage (number of CCSSE responses divided by the institution's total enrollment). This analytical approach used proportions as the dependent variable, which potentially led to range restriction. As an alternative, population counts

could have been estimated; this analytical approach is considered valid, however, considering the results for normality reported next. These two independent variables were combined to include an interaction effect, measuring the relationship between increases in CCSSE disability use with increases in coverage. To improve model fit, the initial regression was screened for cases with undue influence using Cook's distance, centered leverage value, and Mahalanobis distance measures. To assess threats to the statistical validity of this regression, tests for independence, homogeneity of variance, linearity, normality, and multicollinearity were also conducted.

RESULTS

When comparing the descriptive statistics between CCSSE and IPEDS measures of disability service use, the survey averages are higher than the federal reported values (see Table 1). The mean for the liberal calculation of disability service users among the CCSSE aggregated variable (students who used these services at least once per academic term) was 0.10(0.03), with a range of 0.02–0.25. These values indicate that, among the 503 community colleges in the CCSSE sample, the average institutional proportion of students using these services at least once was 10%, with one 2-year institution having only 2% of respondents meet this threshold, and another having 25% of respondents meet it. The same descriptive statistics were calculated for the conservative CCSSE estimate 0.06(0.03), the liberal IPEDS measure 0.03(0.02), and the conservative IPEDS measure 0.058(0.02).

The relationships between CCSSE and IPEDS measures of disability service use were weaker than other measures of demography. The calculated Pearson correlation coefficients between corresponding variables were positive and statistically significant ($p < .01$), rejecting the null hypothesis that there is no relationship between CCSSE aggregated values and IPEDS reported measures. Each of the four permutations of liberal or conservative, CCSSE or IPEDS, measures of disability service use were statistically significant; even the largest value between the conservative CCSSE measure and the liberal IPEDS measure was moderate in size ($r = .331$), however. When considering the practical significance of these relationships, the correlations for the corresponding variables measuring the share of female students ($r = .618$), the share of Black or African American students ($r = .955$), and the share of students enrolled on a part-time basis ($r = .699$) were strong in magnitude.

An initial multiple linear regression model was run to detect outlier cases exerting undue influence on the model (see Table 2). To measure the influence of outlying cases, no institution (case) held a Cook's distance or centered leverage value above its threshold (Lomax & Hahs-Vaughn, 2013); however, 12 cases had Mahalanobis distance measures greater than 13.28 ($p < .01$, $df = 4$) and were removed from the analysis. A review of the scatterplot between the dependent variable (liberal IPEDS measure of disability service use) and the independent variable (the conservative CCSSE sample measure) revealed a positive, linear relationship between these variables. This conclusion was further supported by the plotted unstandardized residuals and unstandardized predicted values having a mostly random grouping and a majority of values resided within $|2|$. When measuring distribution, the S-W test for normality ($SW = .91$, $p < .01$, $df = 503$) suggested that the sample distribution was statistically different from a normal distribution. However, this finding was

Table 1. Descriptive Statistics and Correlations for Study Variables

Variable	M	SD	Range	1	2	3	4	5	6	7	8	9
CCSSE aggregated variables												
1. Disability service users (liberal)[a]	0.10	0.03	0.02–0.25	—								
2. Disability service users (conservative)[b]	0.06	0.03	0.01–0.17	0.88*	—							
3. Female students	0.55	0.07	0.22–0.79	-0.09	-0.10	—						
4. Black or African American students	0.10	0.11	0.00–0.67	0.05	0.01	0.19	—					
5. Part-time students	0.29	0.10	0.04–0.5	-0.20*	-0.14*	0.15	0.05	—				
IPEDS values from institutions in sample												
6. Disability service users (liberal)[c]	0.03	0.02	0.02–0.14	0.27*	0.33*	-0.12*	-0.15*	0.08	—			
7. Disability service users (conservative)[d]	0.06	0.02	0.04–0.14	0.29*	0.31*	-0.09	-0.11	-0.10	1.00*	—		
8. Female students	0.58	0.05	0.33–0.70	-0.08	-0.08	0.62*	0.31*	0.10	-0.10	-0.07	—	
9. Black or African American students	0.12	0.12	0.00–0.73	0.02	0.00	0.17*	0.96*	0.09	-0.13*	-0.11	0.30*	—
10. Part-time students	0.62	0.12	0.21–0.87	-0.19*	-0.13*	0.09	-0.11	0.70*	-0.06	-0.13	0.01	-0.08

[a] Students who used disability services more than once per academic year. [b] Students who used disability services twice or more per academic year. [c] Institutions reported "3 percent or less" of students registered as students with disabilities recoded to 1.5%. [d] For IPEDS, institutions reported "3 percent or less" of students registered as students with disabilities coded as missing. *$p < .01$.

offset through examination of the distribution of the unstandardized residual, both the skewness (1.047) and kurtosis (1.076) values, along with the standardized DFBETA values for the independent variables, resided within acceptable parameters of z.

To test the assumption of independent errors, the Durbin Watson statistic was calculated and its value of 2.08 indicated the model met this assumption. Returning to the scatterplots, the studentized residual was graphed with the unstandardized predicted value, along with each independent variable. Each plot displayed points that were mostly randomly distributed, indicating that the assumption of the homogeneity of variance was met. When evaluating multicollinearity of the model, the variance inflation factor (VIF) was calculated for each of the independent variables. The conservative CCSSE sample measure (VIF = 6.10) indicated noncollinearity for this measure, however, the institutional coverage (VIF = 10.63) suggested that multicollinearity could have been an issue in this model.

Results from the final multiple linear regression model indicate that two of the independent variables—(1) the CCSSE measure of disability use and (2) the interaction effect between this measure and coverage—can be considered to be statistically and significantly related to the liberal IPEDS measure of disability service (dependent variable). Variation within the dependent variable is significantly related to the independent variables in the model $F(3, 487) = 24.41$ ($p < .01$).

The unstandardized partial slope of the conservative CCSSE sample measure (.535) is significant, positive, and stronger compared to the strength of relation measured in the correlation analysis ($t = 5.24$, $df = 3$, $p < .01$), however, they are far from identical measures. The slope measure indicates that, as estimated by the regression model, if 100% of CCSSE respondents were to select and use disability services two or more times per year, the proportion of formally registered students with disabilities reported to IPEDS would be only 54%. Institutional coverage was not statistically significantly related to the dependent variable ($t = 1.29$, $df = 3$, $p = 0.20$).

Table 2. Regressions of Association between IPEDS Liberal Measure[a] of Disability Service Use and CCSSE Survey Data Coverage

Variable	B	SE	t	p	95% CI	VIF
CCSSE disability service users (liberal)[b]	0.53	0.10	5.24	0.00	[0.33, 0.74]	6.10
Coverage	0.23	0.18	1.29	0.20	[-0.12, 0.59]	10.63
Disability service use X Coverage	-6.21	2.65	-2.34	0.02	[-11.42, -1.00]	15.75
R²	0.17					

Note. [a] Institutions reported "3 percent or less" of students registered as students with disabilities recoded to 1.5%. [b] Students who used disability services twice or more per academic year. VIF = variance inflation factor, CI = confidence interval.

The interaction effect between the conservative CCSSE sample measure and institutional coverage would be considered statistically significant only by using a lower threshold ($t = 2.34$, $df = 3$, $p = 0.02$). Considering that the final model included only 491 cases, a lower threshold could be considered (Mayhew et al., 2016). Accepting a more liberal level of significance ($p < .05$), the negative interaction effect indicates that, as both the proportion of CCSSE respondents reporting using disability services and the proportion of total enrollment completing the survey rise, the estimation of the liberal IPEDS measure of disability service falls. When evaluating practical significance, multiple R^2 indicates that the final model explains only 17% of the variance in the dependent variable, suggesting a trivial effect (Cohen, 1988).

DISCUSSION

The purpose of this research is to test the relationship of disability measures between survey data and federal information among more than 500 public community colleges. For campuses with at least 100 respondents, the data from the CCSSE were aggregated to create an institution average and then correlated with values reported to IPEDS. Consistently, the measures of disability were higher on what was selected by students than on what was reported by institutional staff. The measures of gender, race, and enrollment were strongly correlated; the measures related to disability, however, were moderate in magnitude. The CCSSE is administered via a paper survey to randomly selected classes at 2-year institutions, therefore, there may be some concern that a disproportionally high number of students with a disability completed the survey. However, when measuring the interaction effect between the CCSSE disability measure and coverage of the responses, the relation between survey data and federal information weakened, disproving this concern. These findings are discussed through the constructs of research validity measures.

First, this study should be evaluated through the understanding of face validity. Straightforward in name, researchers using this construct to examine the face value of a study's design. This study is not research on disability per se, instead, it is a measure of disability service use and registration. Furthermore, the two data sources measure disability in critically different ways. On the CCSSE, students are asked how often they use disability services during the academic year. On IPEDS, however, institutional researchers report on the percentage of students formally registered as students with disabilities. Fundamentally, these are two different measures because students might use these services without formal registration, moving this study from an investigation measuring data quality to one measuring data incongruency. Central concerns regarding the face validity of this study may invalidate it to some. To others, this research highlights the difficulty of measuring the concept of identity among students.

Second, construct validity can be a useful way to understand and critique these findings. Researchers using this type of validity examine the degree to which the tools in the study accurately measure the phenomena the research is intended to investigate. The largest threat to the construct validity in this study is understanding the degree to which the survey respondents can accurately differentiate between services for students with disabilities and other campus services. For example, students may

receive tutoring supportive of disability identity; however, these tutoring opportunities may be provided out of a functional area that is different from disability services. An inability to distinguish between services may lead to over-inflation of survey averages.

Third, this study can be evaluated through the understanding of convergent validity. Researchers using this construct examine the strength of relation between study measures. To gain perspective on the relationship under consideration, other measures of demography were correlated between the survey and federal data. These correlations were strong, particularly when comparing the proportion of survey respondents who identify as Black or African American to the percentage of this population reported by each institution ($r = .955$). The measure of service use or accommodations is fundamentally different from measure of identity related to gender, race, and enrollment, which could be a reason for the lack of convergence among disability proportions between the data sets. This finding strengthens the premise that these two measures and their data sources are comparable, although their different definitions preclude them from the same measure of data quality and instead serve only as a way to explore data incongruency.

Fourth, discriminant validity can be a useful way to understand how to underline the importance of this study. As an antithesis of convergent validity, this type of validity is used by researchers to demonstrate the ways that measures diverge from each other. As proven by the correlation analysis, the relationship between the CCSSE survey data and the IPEDS federal data was moderate in strength and did not improve when accounting for coverage among survey samples. This modeling correlation

presents concerns that can inform both survey design and the uses of disability data by scholars, and federal reporting practice. While constructs of validity can be helpful in interpreting results, they offer conflicting findings of the usefulness of these results.

Implications for Practice

This study explores the ways disability is measured on the CCSSE and through IPEDS, and has implications for how institutional researchers and scholars interact with these data. For institutional researchers, the lack of convergence among these data suggests incongruency between measures. Of the 503 institutions included in this study, only 203 provided a value for the prompt, "percent of undergraduates who are formally registered as students with disabilities when percentage is more than 3 percent." Of the 300 institutions that did not report a value, 251 had aggregated CCSSE averages of at least 4% of respondents reporting using disability services two or more times per year. Even more concerning, 71 of the community colleges had at least 8% of respondents in this group, which is more than double the limit for not reporting a value. For the NCES, which is interested in ensuring ADA compliance, these margins of difference are concerning even with the issues of face validity and construct validity described earlier.

For scholars, the CCSSE measure is limited, and "this item does not measure the other two components of this model [neither] (a) the person nor (b) the person's impairment" (Zilvinskis, 2020, p. 258). For scholars who are trying to understand pathways of success for students with disabilities, using survey items in which respondents can self-identify and provide more information about their disability

would enhance the usefulness of this information; in other words, the experiences of students with different types of disabilities, from physical to psychological, are different. Similarly, IPEDS data do not provide disability differentiation (Cox et al., 2020). For scholars, the moderate correlation found here cautions those who aggregate survey data for multilevel modeling because survey measures might not provide proper institution-level averages for disability. This issue becomes particularly problematic when researchers use the measures of "Use" and "Registration" interchangeably without considering how those measures differ qualitatively.

Broadly, these findings challenge if either of these instruments accurately measure disability among students. Policymakers should use more-comprehensive definitions of disability, since many students with disabilities do not register on campus. In a longitudinal study of high school students with disabilities transitioning to a higher-education institution, Newman and Madaus (2015) found that only 35% of those students will register with their disability services offices, meaning that a majority of students with disabilities are rendered invisible with these two measures.

Limitations

Along with the issues explored above through face validity and construct validity, there are a few other considerations influencing the accuracy of this study. First, as argued by Cox and Nachman (2020), because the format of the CCSSE is "eight pages long with over 115 bubbles to fill in," it might be difficult for some students with disabilities to complete it, thus suppressing the participation among this population (p. 244). Another source of

suppression may exist within the exclusion of high school students in the CCSSE. If CCSSE excludes high schoolers but IPEDS includes high school students among the calculation of percentage of undergraduate students, that could impact the ability to translate one to the other. If suppression is occurring, then the difference between survey responses and IPEDS information may be even greater than recorded here.

Second, there is some additional misalignment between CCSSE and IPEDS measures beyond those related to disability measures. For example, on the survey, respondents are provided the stem, "Your gender identity:" with the options "Man," "Woman," "Other," and "I prefer not to respond," whereas the data reported to IPEDS are, "The percent of total enrollment that are women." This misalignment may diminish the strength of correlation of the other aspects of identity considered in this study.

Third, CCSSE institutions self-select to administer the survey, which presents another misalignment: the difference in part-time students in the CCSSE sample versus IPEDS (0.29 vs. 0.62), which is probably related to survey administration, and which is much more likely to capture full-time student responses in class than part-time ones. Although quite a few institutions were included in this study (503), there are more than 3,000 2-year institutions, thus articulating the distinction offered earlier by Kimball et al. (2016). This research explored a large survey sample, but it is not necessarily a nationally generalizable study.

CONCLUSION

The focus of this study is to understand the ways data incongruency may influence the ability to identify underserved students, thereby hindering goals to create equitable opportunities. This research can inform the ways higher education professionals leverage data to understand the size of the population of students with disabilities and improve their success. These inequitable power structures of data collection can further marginalize disabled students. A central issue in research on students with disabilities is that identifying these students can be difficult and educators cannot improve outcomes for students they cannot see (metaphor intended).

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